



National Unit specification: general information

Unit title: Process Operations: Utilities

Unit code: FM3E 11

Superclass: YB

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Summary

This Unit is designed for candidates with little or no prior knowledge of the principles of Utilities Operations who wish to develop their existing skills and provide a foundation of knowledge in this subject.

The aim of this Unit is to provide candidates with basic knowledge and understanding of the principles, components and functions of Utilities Operations which would lead to further training within the oil and gas industry allowing them to become a skilled worker in the industry.

For this Unit candidates will be required to demonstrate knowledge and understanding of:

- ◆ disposing of waste water within the oil and gas industry
- ◆ gas turbines and diesel engine prime movers
- ◆ generating electrical power within the oil and gas Industry
- ◆ providing diesel within the oil and gas industry
- ◆ providing instrument and service air within the oil and gas industry
- ◆ providing cooling water within the oil and gas industry
- ◆ fire and gas and Emergency Shut Down (ESD) systems within the oil and gas industry

This Unit is an optional Unit of the National Certificate in Engineering Systems or may be offered on a free-standing basis. It will also contribute towards providing underpinning knowledge for the level 2 SVQ in *Process Operations: Hydrocarbons*.

National Unit specification: general information (cont)

Unit title: Process Operations: Utilities

Outcomes

- 1 Describe the main components and functions of waste water disposal systems within the oil and gas industry.
- 2 Describe the main components and functions of gas turbines and diesel engine prime movers in the oil and gas industry.
- 3 Describe how electrical power is generated and the main uses of prime movers in the oil and gas industry.
- 4 Describe how diesel is stored, cleaned and used in the oil and gas industry.
- 5 Describe the main components and functions of instrument and service air systems within the oil and gas industry.
- 6 Describe the main components and functions of cooling water systems within the oil and gas industry.
- 7 Describe the main components and functions of fire and gas and Emergency Shut Down (ESD) systems within the oil and gas industry.

Recommended entry

While entry is at the discretion of the centre, candidates would ideally have a working knowledge of basic mathematics and chemistry or be educated to General level at Standard Grade in these subjects.

Credit points and level

1 credit at SCQF level 5 (6 SCQF credit points at SCQF level 5*).

**SCQF credit points are used to allocate credit to qualifications in the Scottish Credit and Qualifications Framework (SCQF). Each qualification in the Framework is allocated a number of SCQF credit points at an SCQF level. There are 12 SCQF levels, ranging from Access 1 to Doctorates.*

Core Skills

There is no automatic certification of Core Skills in this Unit.

This Unit provides opportunities for candidates to develop aspects of the following Core Skills:

Problem Solving (SCQF level 5)

Communication (SCQF level 5)

These opportunities are highlighted in the Support Notes of this Unit Specification.

National Unit specification: statement of standards

Unit title: Process Operations: Utilities

Acceptable performance in this Unit will be the satisfactory achievement of the standards set out in this part of the Unit specification. All sections of the statement of standards are mandatory and cannot be altered without reference to SQA.

Outcome 1

Describe the main components and functions of waste water disposal systems within the oil and gas industry.

Performance Criteria

- (a) Describe clearly the main components and functions of a hydro-cyclone and two other water separation methods.
- (b) Describe clearly the main components and functions of a produced water disposal system.
- (c) Describe clearly the main components and functions of sewage water disposal.

Outcome 2

Describe the main components and functions of gas turbines and diesel engine prime movers in the oil and gas industry.

Performance Criteria

- (a) Describe clearly the main components and use of gas turbines in the oil and gas industry.
- (b) Describe clearly the main components and use of diesel engines in the oil and gas industry.

Outcome 3

Describe how electrical power is generated and the main uses of prime movers in the oil and gas industry.

Performance Criteria

- (a) Describe clearly how electrical power is generated.
- (b) Describe clearly the main uses of prime movers in the oil and gas industry.

National Unit specification: statement of standards (cont)

Unit title: Process Operations: Utilities

Outcome 4

Explain how diesel is stored, cleaned and used in the oil and gas industry.

Performance Criteria

- (a) Explain clearly how and where diesel is stored.
- (b) Explain clearly how and why diesel is cleaned prior to its use.
- (c) Explain clearly how and where diesel is used.

Outcome 5

Describe the main components and functions of instrument and service air systems within the oil and gas industry.

Performance Criteria

- (a) Describe clearly the main parts of a Reciprocating Compressor.
- (b) Describe clearly the main parts of a Rotary Compressor.
- (c) Describe clearly a typical service and instrument air system.

Outcome 6

Describe the main components and functions of cooling water systems within the oil and gas industry.

Performance Criteria

- (a) Describe clearly the main components of a centrifugal pump.
- (b) Describe clearly a typical cooling water system.

Outcome 7

Describe the main components and functions of fire and gas and Emergency Shut Down (ESD) systems within the oil and gas industry.

Performance Criteria

- (a) Describe clearly a typical fire and gas system.
- (b) Describe clearly a typical Emergency Shut Down (ESD) system.

National Unit specification: statement of standards (cont)

Unit title: Process Operations: Utilities

Evidence Requirements for this Unit

Written and/or oral evidence is required, to demonstrate that candidates have achieved all Outcomes and Performance Criteria.

Assessment should be supervised, closed-book and delivered at an appropriate time in the Unit when candidates have developed knowledge and understanding of all of the following:

- ◆ disposing of waste water with the oil and gas industry
- ◆ gas turbines and diesel engine prime movers
- ◆ generating electrical power within the oil and gas industry
- ◆ providing diesel within the oil and gas industry
- ◆ providing instrument and service air within the oil and gas industry
- ◆ providing cooling water within the oil and gas industry
- ◆ fire and gas and Emergency Shut Down (ESD) systems within the oil and gas industry

In this Unit an appropriate assessment covering all Outcomes could include a question paper consisting of a balance of multiple choice, short answer, and restricted response and structured questions. Total assessment time covering all Outcomes should not exceed 2 hours.

National Unit specification: support notes

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This part of the Unit specification is offered as guidance. The support notes are not mandatory.

While the exact time allocated to this Unit is at the discretion of the centre, the notional design length is 40 hours.

Guidance on the content and context for this Unit

It is recommended that this Unit be delivered in the context of the Oil and Gas sector. This Unit is designed to provide candidates with an understanding of the principles and practices associated with the equipment and processes used in Gas Process Operations.

The Unit is designed to allow center's the flexibility to deliver knowledge and understanding based on the range of equipment available in a simulated or real work environment. The main areas to be covered are:

Outcome 1

- ◆ Hydro-cyclones and other separation methods eg skimmer tanks, flash drum, coalesce, floatation treatment, plate separators or interceptors
- ◆ Produced water disposal eg discharge into sea, produced water re-injection and treatment
- ◆ Sewage disposal eg compact sewage facilities

Outcome 2

- ◆ Gas Turbines main component parts eg rotor, casings fixed blades, seals, combustion chamber and exhaust.
- ◆ Gas turbine how it works, type of fuel/combustion, drive and exhaust
- ◆ Diesel Engine main component parts eg crankshaft, con-rod, piston, cylinder-head, exhaust, fuel injector.
- ◆ Diesel Engine how it works, diesel four-stroke cycle.

Outcome 3

- ◆ Generation of Electrical Power, basic parts of and alternator, how it generates electrical three phase electrical power.

Outcome 4

- ◆ Storage of Diesel eg in tanks and in legs of platform
- ◆ Distribution of diesel eg booster pumps, filters
- ◆ Grades of Diesel eg gas oil, Marine Diesel
- ◆ Methods of cleaning/filtering diesel before use eg Centrifugal purifier, Centrifuge, filters

National Unit specification: support notes (cont)

Unit title: Process Operations: Utilities

Outcome 5

- ◆ Reciprocating Compressor eg two stage
- ◆ Vane and Screw Compressors
- ◆ Cleaning of instrument air eg filters, driers
- ◆ Lubricators for power tools
- ◆ Air distribution eg typical distribution system.

Outcome 6

- ◆ Centrifugal pumps
- ◆ Heat exchangers (Plate/Tube)
- ◆ Cooling water distribution

Outcome 7

- ◆ Typical Fire and Gas system
- ◆ Typical Emergency Shut Down (ESD) system
- ◆ Combined fire and gas and ESD system

Guidance on learning and teaching approaches for this Unit

While the use of case study material is particularly recommended for both the learning and teaching components of this Unit, other suggested teaching and learning methods for this Unit could include the use of visual aids, Information Communication Technology (ICT), group lectures and discussion, practical demonstrations, question and answer sessions, directed study, and industrial/site visits.

Formative work for the Unit could specifically include group discussion and role play emphasising workplace health and safety issues and events specific to Gas Dehydration and Compression. Such an approach could be particularly beneficial to candidates with no industrial experience.

Case studies could be used as a stimulus to provide opportunities for completing appropriate documentation and reading and evaluating relevant legislation, policies and procedures. Role play of typical industry scenarios could additionally enhance the co-operative working skills of candidates.

National Unit specification: support notes (cont)

Unit title: Process Operations: Utilities

Guidance on approaches to assessment for this Unit

Candidates should be made aware of what will be required of them in order to achieve credit for the Unit. They should be encouraged to discuss the work with the trainer/tutor and their colleagues. Help and encouragement should be given throughout the Unit so that the candidates become confident in their ability to achieve the Performance Criteria.

Preparation for assessment should include formative work with opportunities for constructive feedback.

In this Unit an appropriate assessment for Outcomes 1, 2, 3 and 4 could include:

- ◆ a question paper consisting of a balance of multiple choice, short answer, restricted response and structured questions
- ◆ workshop practical in a real or simulated workplace setting (eg oral questioning associated with 'walking the line' or tracing fluid flow paths using Piping & Instrument Diagrams (P&IDs))

Where candidates require re-assessment there should be a different set of questions available for that re-assessment.

Opportunities for the use of e-assessment

E-assessment may be appropriate for some assessments in this Unit. By e-assessment we mean assessment which is supported by Information and Communication Technology (ICT), such as e-testing or the use of e-portfolios or e-checklists. Centres which wish to use e-assessment must ensure that the national standard is applied to all candidate evidence and that conditions of assessment as specified in the Evidence Requirements are met, regardless of the mode of gathering evidence. Further advice is available in *SQA Guidelines on Online Assessment for Further Education (AA1641, March 2003)*, *SQA Guidelines on e-assessment for Schools (BD2625, June 2005)*.

Opportunities for developing Core Skills

Candidates will develop skills in *Problem Solving*, which are in Critical Thinking, Planning and Organising, and Reviewing, as they undertake the Unit. They need to examine and take account of all issues affecting oil and gas separation operations before starting practical work. This will include identifying process faults and troubleshooting to resolve these faults. They will meet all health and safety requirements before carrying out any practical sessions. Review and evaluation of achievement with assessor support and guidance should be a naturally occurring process in formative and summative work.

Group discussion of safety issues during formative work could enhance both problem solving and oral communication skills and would ensure opportunities to practice the use of appropriate terminology and improve listening skills in a work-related context.

National Unit specification: support notes (cont)

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Although skills in Written Communication are not formally assessed candidates should be given opportunities to develop their abilities to communicate to a standard acceptable in the vocational area. They need to be able to read, understand Operating Procedures and Piping and Instrument Diagrams (P&IDs) and could also be encouraged to refer to and evaluate a range of background information and advice on safety issues and equipment. Reports should be technically accurate, with attention to spelling and punctuation.

Disabled candidates and/or those with additional support needs

The additional support needs of individual candidates should be taken into account when planning learning experiences, selecting assessment instruments, or considering whether any reasonable adjustments may be required. Further advice can be found on our website www.sqa.org.uk/assessmentarrangements

History of changes to Unit

Version	Description of change	Date

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